



# Forest Health Protection

## Pacific Southwest Region

Date: November 10, 2009  
File Code: 3420

To: District Ranger, Warner Mountain Ranger District, Modoc National Forest

Subject: Evaluation of bark beetle activity in the Homestead Flat Forest Health Project,  
(FHP Report NE10-03)

At the request of Anne Mileck, District Silviculturist, and Bill Reading, NEPA Planning Forester, I conducted a field evaluation of the Homestead Flat Forest Health Project on October 8, 2009. The objectives of the visit were to assess the current stand conditions, evaluate the project for potential funding through the Forest Health Protection (FHP), Western Bark Beetle Initiative and determine if expedited implementation was justified under Section 102(a)(4) of the Healthy Forest Restoration Act. Anne Mileck and Bill Reading accompanied me in the field.

### **Background**

The 2,300 acre Homestead Flat Forest Health Project is located between the South Warner Wilderness and a designated roadless area near the Patterson Guard Station (T38, 39N, R16E, Sections 33, 34, 3 and 4) at elevations between 7,200 to 7,800 feet. Precipitation for the site averages between 30 - 40 inches per year. Stands in this area are mostly mixed conifer stands consisting of washoe pine (*Pinus washoensis*), ponderosa pine (*Pinus ponderosa*), western white pine (*Pinus monticola*), lodgepole pine (*Pinus contorta*), white fir (*Abies concolor*) and aspen (*Populus tremuloides*). Approximately 1/5 of the project area is dominated by lodgepole pine with scattered white fir and western white pine. The entire Warner Mountain range has experienced high levels of bark beetle caused tree mortality over the past several years due to factors such as overstocking and extended drought (Figure 1). The mountain pine beetle (*Dendroctonus ponderosae*) has caused very high levels of lodgepole pine and whitebark pine (*Pinus albicaulis*) mortality in areas adjacent to the Homestead Flat project area over the past 4 years both within the South Warner Wilderness to the north and the inventoried roadless area to the south. Overall, tree mortality has expanded into new areas and intensified within previously infested stands over the last two years (FHP, ADS Data, Figure 2, 3, and 4).

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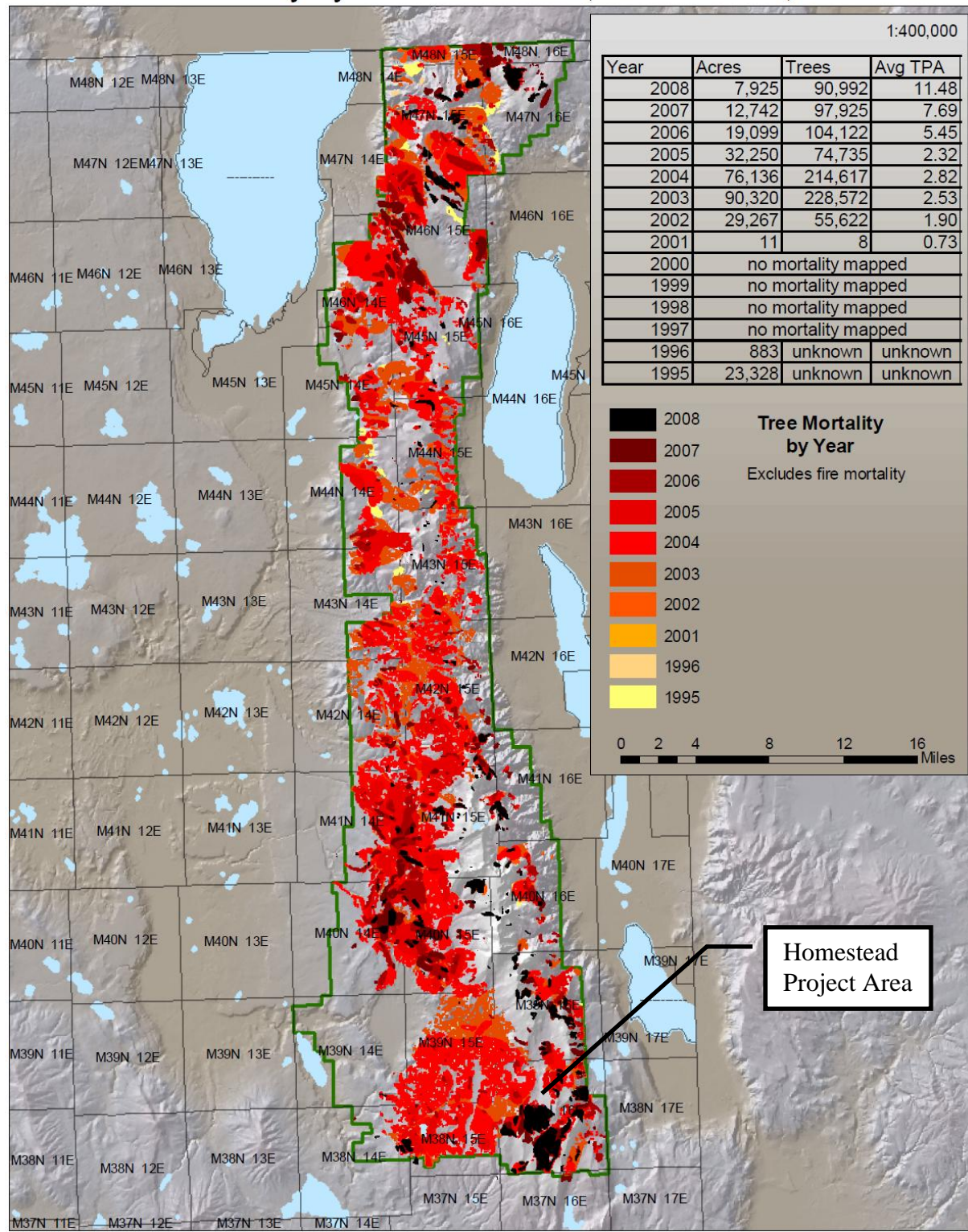
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**Figure 1. 1995 – 2008 tree mortality, Warner Mountains, CA.**

**Tree Mortality by Year 1995-2008, Warner R.D., MDF**





Polygons labeled with tree species and estimated number of dead trees per acre.

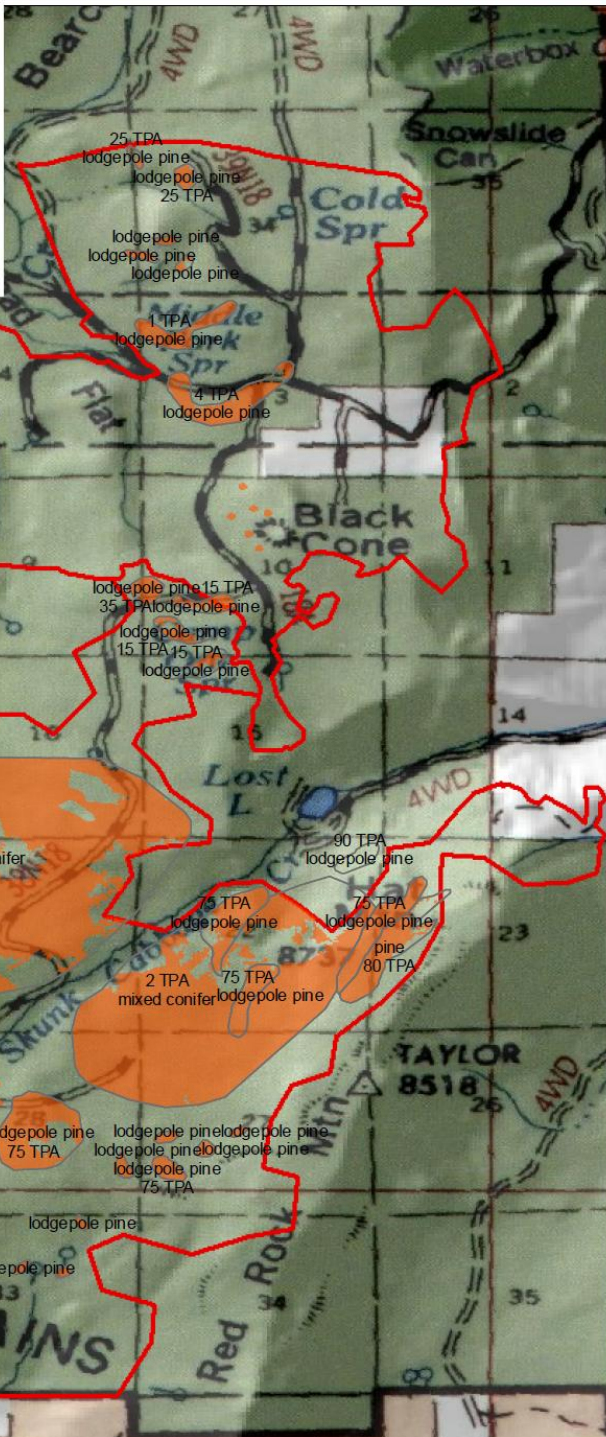
Total Acres	Total Trees	Avg TPA

Areas of Tree Mortality, 2009  
South Warner Mountains, MDF

Total Acres	Total Trees	Avg TPA
1767	27,610	15.6

Data from USFS Aerial Detection Survey, clipped by Cal/Veg data to exclude areas classified as nonforested or containing trees averaging less than 11" dbh. Species and tree per acre labels derived from surveyor's observations. Acres, number of trees and average TPA calculated for areas inside project boundary.

## Areas of Tree Mortality, 2009 South Warner Mountains, MDF






**Figure 3. 2008 Tree Mortality, South Warner Mountains (The Homestead Flat project includes the north red outlined polygon; the inventoried roadless area includes the south red outlined polygon).**

Polygons labeled with tree species and estimated number of dead trees per acre.

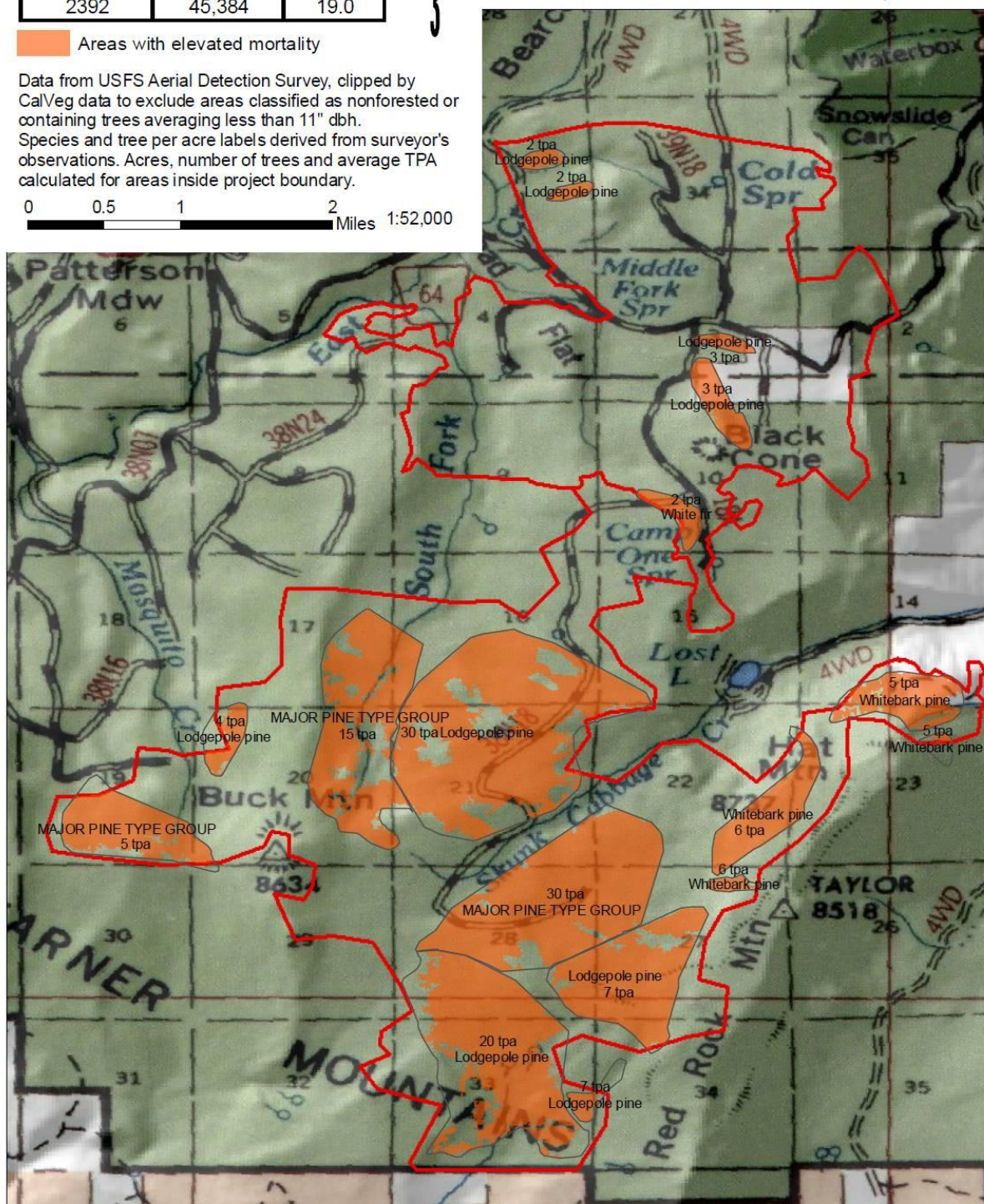
Total Acres	Total Trees	Avg TPA
2392	45,384	19.0

 Areas with elevated mortality

Data from USFS Aerial Detection Survey, clipped by CalVeg data to exclude areas classified as nonforested or containing trees averaging less than 11" dbh. Species and tree per acre labels derived from surveyor's observations. Acres, number of trees and average TPA calculated for areas inside project boundary.

0 0.5 1 2 Miles 1:52,000

## Areas of Tree Mortality, 2008 South Warner Mountains, MDF






**Figure 4. 2007 Tree Mortality, South Warner Mountains (The Homestead Flat project includes the north red outlined polygon; the inventoried roadless area includes the south red outlined polygon).**

Polygons labeled with tree species and estimated number of dead trees per acre.

Total Acres	Total Trees	Avg TPA
2310	12,256	5.3

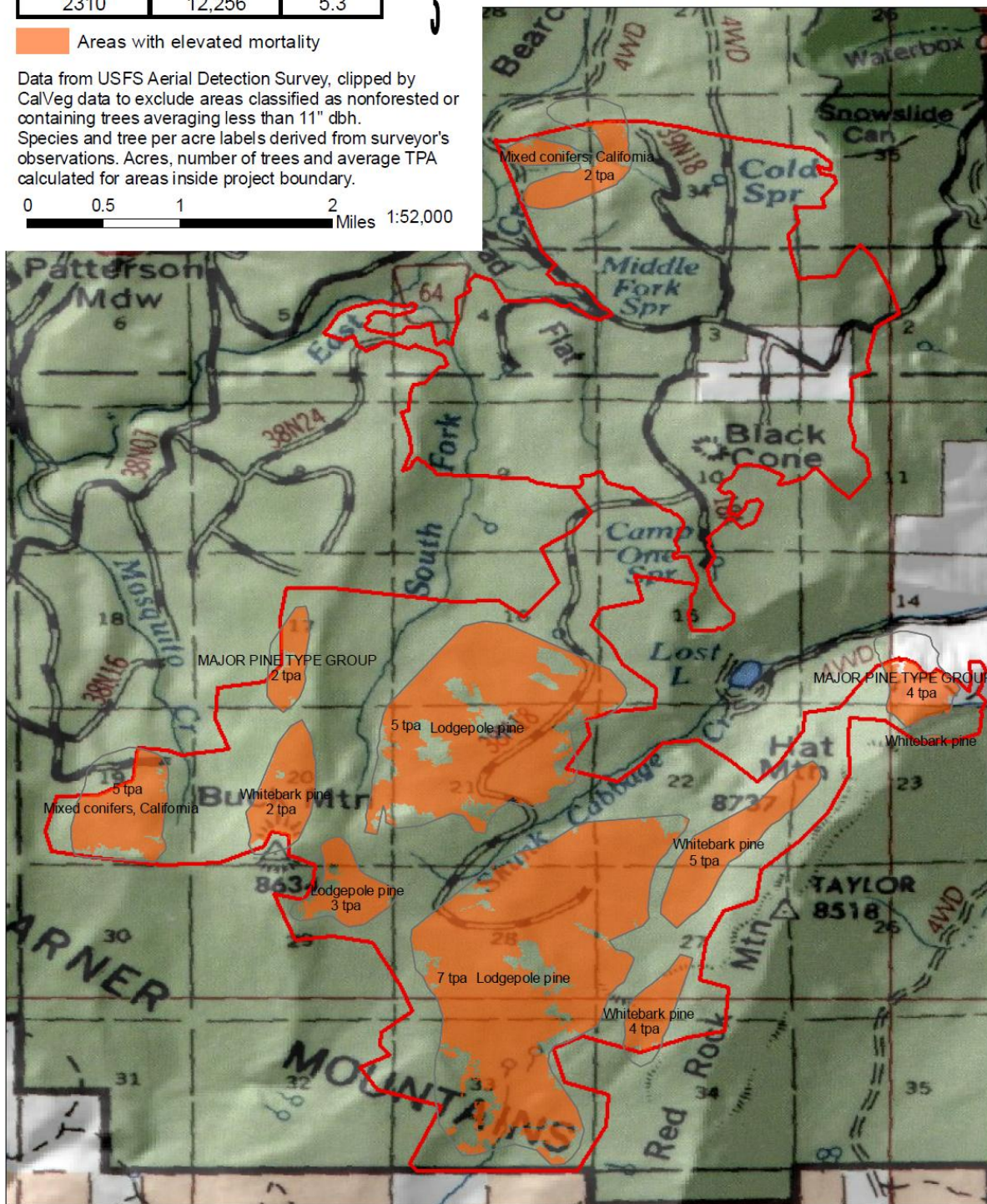
 Areas with elevated mortality

Data from USFS Aerial Detection Survey, clipped by CalVeg data to exclude areas classified as nonforested or containing trees averaging less than 11" dbh.

Species and tree per acre labels derived from surveyor's observations. Acres, number of trees and average TPA calculated for areas inside project boundary.

0 0.5 1 2 Miles 1:52,000

## Areas of Tree Mortality, 2007 South Warner Mountains, MDF



## **Observations**

Mountain pine beetle activity within the Homestead Flat project area has been limited to a few pockets of lodgepole pine within the predominantly mixed conifer stand. These pockets contain older mortality and green infested trees.

White fir mortality caused by the fir engraver beetle (*Scolytus ventralis*) was observed at the north end of the project area.

Stands are in an overstocked, high hazard condition in terms of their susceptibility to successful bark beetle attacks. Preliminary stand exams show that this area is comprised of lodgepole pine, western white pine, washoe pine, ponderosa pine, white fir and quaking aspen, both in the overstory and in the regenerating understory with basal areas ranging from about 130 to 200 ft<sup>2</sup>/acre.

Lodgepole pine dwarf mistletoe (*Arceuthobium americanum*) was observed in larger diameter lodgepole pine at the south end of the project area. A few of these infested trees were successfully attacked by mountain pine beetle (Figure 6).

Two large diameter (>30" DBH) Washoe/Ponderosa pines were recently attacked and killed by mountain pine beetles at the north end of the project area.

## **Discussion**

The Homestead Flat Forest Health Project area has experienced relatively modest tree mortality, despite overstocked stand conditions, prolonged drought and the surrounding mountain pine beetle outbreak. This can be partially attributed to these stands containing none host species such as white fir and possibly less preferred host species such as large diameter washoe and ponderosa pine. However, it is very likely that as the lodgepole pine host material is depleted in adjacent areas mountain pine beetle pressure will increase within these stands resulting in high levels of mortality of all pine species. Of particular concern is the large diameter washoe and ponderosa pine that are scattered throughout the area and growing in dense stands with high percentages of lodgepole pine. Past observations of mountain pine beetle activity on the nearby Fremont National Forest demonstrated that mountain pine beetles, initially attracted to lodgepole pines, can subsequently attack larger diameter, adjacent ponderosa pines.

Analysis of the total number of trees per acre of non-lodgepole species shows sites are fully stocked with washoe pine, ponderosa pine, western white pine, white fir and aspen. This provides the opportunity to significantly reduce the amount of susceptible lodgepole pine within the stand, reduce overall stand density to a sustainable level, increase species diversity and still meet other management objectives such as maintaining canopy cover for wildlife and preserving the old growth washoe and ponderosa pine component.



Figure 6. Dead lodgepole pine previously infected with dwarf mistletoe.



The Homestead Flat project area is one of the last areas in the south Warner Mountains that has experienced low levels of mountain pine beetle caused tree mortality and it is one of the few areas where preventative thinning treatments are feasible. Thinning stands to densities that are appropriate for the site, if implemented without delay, combined with the increase in species diversity should effectively reduce tree competition for limited water and nutrients and provide a buffer to the expected impacts from mountain pine beetle; minimizing future tree mortality. In mixed conifer stands, removing lodgepole pines that are adjacent to large ponderosa and washoe pine should reduce the chance of mountain pine beetles successfully attacking these trees. In areas of pure lodgepole pine, approximately 1/5 of the project area, thinning treatments should emphasize species, age, size and spatial diversity to reduce stand hazard. Removing individual trees that are heavily infected with dwarf mistletoe should be the top priority for any green tree removal operation. In general, pure lodgepole pine stands should be thinned to 80 to 100 sq.ft./acre to reduce their susceptibility to bark beetle attacks. However, reducing the basal area in extremely dense stands in one entry can result in wind throw and/or snow breakage of residual trees, therefore, desired stocking levels in pure lodgepole pine stands may be best achieved through multiple entries over time. Aspen dominated stands, which are heavily encroached by lodgepole pines, should have all conifers removed.

In order to achieve the desired objective of reducing the impacts of mountain pine beetle on these stands, it is recommended that the District utilize provisions of the Healthy Forest Restoration Act (HFRA) to implement the thinning treatments as soon as possible. Section 102(a)(4) of the HFRA authorizes expedited vegetation management projects on National Forest Lands where an insect epidemic exists and poses a significant threat to an ecosystem component or forest resource. This project area meets the two requirements of this HFRA Section. The first requirement is met by the current mountain pine beetle outbreak, and associated tree mortality, which is well documented throughout the entire Warner Mountain range. Infested areas immediately adjacent to the project area have expanded and intensified over the past four years and pose a high risk, or threat, to stands in the Homestead project area. The second requirement is met by the overstocked conditions within the project area combined with the current drought, which has put these stands in a high hazard condition (i.e. extremely susceptible to successful mountain pine beetle attacks). Without project implementation, there exists a high probability that these stands, including the old growth ponderosa and washoe pine component, will be significantly impacted, experiencing high levels of mountain pine beetle caused tree mortality over the next few years.

If you have any questions regarding this report and/or need additional information please contact me at 530-252-6431 or [dcluck@fs.fed.us](mailto:dcluck@fs.fed.us).

*/s/ Danny Cluck*

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## **Bark Beetle Information**

### **Mountain pine beetle**

The mountain pine beetle, *Dendroctonus ponderosae*, attacks the bole of ponderosa, lodgepole, sugar and western white pines larger than about 8 inches dbh. Extensive infestations have occurred in mature lodgepole pine forests. Group killing often occurs in mature forests and young overstocked stands of ponderosa, sugar and western white pines.

### **Evidence of Attack**

The first sign of beetle-caused mortality is generally discolored foliage. The mountain pine beetle begins attacking most pine species on the lower 15 feet of the bole. Examination of infested trees usually reveals the presence of pitch tubes. Pitch tubes on successfully infested trees are pink to dark red masses of resin mixed with boring dust. Creamy, white pitch tubes indicate that the tree was able to "pitch out" the beetle and the attack was not successful. In addition to pitch tubes, successfully infested trees will have dry boring dust in the bark crevices and around the base of the tree. Attacking beetles carry the spores of blue-staining fungi which develop and spread throughout the sapwood interrupting the flow of water to the crown. The fungi also reduces the flow of pitch in the tree, thus aiding the beetles in overcoming the tree. The combined action of both beetles and fungi causes the needles to discolor and the tree to die.

### **Life Stages and Development**

The beetle develops through four stages: egg, larva, pupa and adult. The life cycle of the mountain pine beetle varies considerably over its range. One generation per year is typical, with attacks occurring from late June through August. Two generations per year may develop in low elevation sugar pine. Females making their first attacks release aggregating pheromones. These pheromones attract males and other females until a mass attack overcomes the tree. The adults bore long, vertical, egg galleries and lay eggs in niches along the sides of the gallery. The larvae feed in mines perpendicular to the main gallery and construct small pupal cells at the end of these mines where they pupate and transform into adults.

### **Conditions Affecting Outbreaks**

The food supply regulates populations of the beetle. In lodgepole pine, it appears that the beetles select larger trees with thick phloem, however the relationship between beetle populations and phloem thickness in other hosts has not been established. A copious pitch flow from the pines can prevent successful attack. The number of beetles, the characteristics of the tree, and the weather affect the tree's ability to produce enough resin to resist attack. Other factors affecting the abundance of the mountain pine beetle include nematodes, woodpeckers, and predaceous and parasitic insects. As stand susceptibility to the beetle increases because of age, overstocking, diseases or drought, the effectiveness of natural control decreases and pine mortality increases.